

CLAIMS

1. A system for water treatment comprising a first treatment area for receiving waste water and aerating the waste water to enhance aerobic bacterial treatment of waste water, a second treatment area for receiving waste water from the first treatment area and circulating waste water within it to enhance bacterial treatment of waste water, a third treatment area configured to receive waste water from the second treatment area and including a filter having at least one membrane for filtering the waste water to substantially remove particulate matter of a predetermined size, an outlet connected to the filter and configured to output filtered waste water from the filter and a transfer means for transferring waste water from the third treatment area to the first treatment area.

2. The system as claimed in claim 1 wherein the transfer means transfers waste water directly from the first treatment area to the third treatment area.

3. The system as claimed in claim 1 wherein the transfer means transfers waste water indirectly from the third to the first transfer area.

4. The system as claimed in claim 1 wherein the transfer means includes at least one conduit.

5. The system as claimed in claim 1 wherein the first treatment area includes a chamber.

6. The system as claimed in claim 5 wherein the second treatment area may include a second chamber.

7. The system as claimed in claim 1 wherein the transfer means comprises an opening in a common wall between the first and third treatment areas.

8. The system as claimed in claim 1 wherein the transfer means includes a plurality of openings each located at a different level with respect to the upper liquid level in the system.

9. The system as claimed in claim 1 wherein the transfer means comprises an opening in the wall

between the first and third treatment areas, which opening can be changed in height.

10. The system as claimed in claim 4 wherein the conduit has an outlet in the first treatment area, which outlet comprises an opening which has a distance from the upper fluid level in the system which is able to be changed.

11. The system as claimed in claim 10, 9, 8 or 7 comprising a controller for controlling the level of the opening.

12. The system as claimed in claim 11 wherein the controller comprises a data processor which is able to control the distance h_B of the opening from the upper water level in the system based on the formula

$$h_B = \left(\frac{3}{2} \frac{Q_B \cdot V_M}{AK \sqrt{2g}} \right)^{\frac{2}{3}}$$

$$Q_B = \frac{2}{3} (q_B \times t_B)$$

q_B = the rate of flow through the opening

t_B = the time for the fluid surface to fall below the opening

V_M = the rate of fall of fluid level in the third treatment area

A = the cross sectional area of the opening

K = the bleed hole form factor (of the opening)

g = the gravitational constant.

13. The system as claimed in claim 1 wherein the transfer means comprises a hole between the first and third treatment areas, which opening comprises a bleed hole having a water head value above the bottom of the bleed hole which is calculated by the formula:

$$h_B = \left(\frac{3}{2} \frac{Q_B \cdot V_M}{AK \sqrt{2g}} \right)^{\frac{2}{3}}$$

wherein h_B = the water head above the bottom of the opening, $Q_B = \frac{2}{3} (q_B \times t_B)$

q_B = the rate of flow through the opening

t_B = the time for the fluid surface to fall below the opening

V_m = the rate of fall of fluid level in the third treatment area

A = the cross sectional area of the opening

K = the bleed hole form factor (of the opening)

g = the gravitational constant.

14. The system as claimed in claim 1 wherein the first treatment area includes a circulation means for circulating waste water within the first treatment area.

15. The system as claimed in claim 14 wherein the opening includes an insert which is able to reduce the size of the opening.

16. The system as claimed in claim 7 or 8 wherein the opening has a reducing width to reduce blockage.

17. The system as claimed in claim 7, 8 or 15 wherein the opening is located between high and low water levels in the third treatment area.

18. The system as claimed in claim 1 including first pressure means for transferring waste water from the first to the second treatment areas.

19. The system as claimed in claim 18 including second pressure means for transferring waste water from the second to the third treatment area.

20. The system as claimed in claim 19 including a third pressure means for transferring waste water from the third to the first treatment area.

21. The system as claimed in claim 20 including a fourth treatment area with the transfer means configured to transfer waste from the third treatment area to the fourth treatment area.

22. The system as claimed in claim 21 wherein the waste water is transferred from the fourth treatment

area to the first treatment area.

23. The system as claimed in claim 1 wherein the transfer means includes one or more conduits connecting the third treatment area with the first
5 treatment area.

24. The system as claimed in claim 1 wherein the first treatment area includes a circulation means for circulating waste water within it.

25. The system as claimed in claim 1 wherein
10 the third treatment area includes a circulation means for circulating waste water within it.

26. The system as claimed in claim 1 wherein the first treatment area is connected to the second treatment area through a first feed means including a
15 conduit and a pump.

27. The system as claimed in claim 1 wherein the second treatment area is connected to the third treatment area through a second feed means.

28. The system as claimed in any one of the
20 preceding claims wherein the first treatment area includes a first tank, the second treatment area includes a second tank and the third treatment area includes a third tank.

29. The system as claimed in claim 1 including a control means for controlling waste water entering and
25 leaving the system to maintain the waste water level between upper and lower limits.

30. The system as claimed in claim 29 wherein the control means includes pumps for pumping fluid into and out of the system.

31. The system as claimed in claim 30 wherein
30 the second treatment area maintains a substantially homogenous sludge waste water mix.

32. The system as claimed in claim 31 wherein
35 the first treatment area maintains a substantially homogenous sludge waste water mix.